Before the
Federal Communications Commission
Washington, D.C. 20554

In the Matter of	)	
	)	
Robert Bosch LLC, Petition for Rulemaking	)	RM-11844
For Amendment of Rules Governing Ultra-	)	
Wideband Devices and Systems	)	

COMMENTS OF ALTEROS, INC.

Alteros, Inc. ("Alteros"), a leading innovator of professional wireless microphone systems operating in alternative spectrum, in support of the FCC's on-going efforts to advance the use of spectrum and efficient wireless microphone equipment, submits these Comments in response to a Petition for Rulemaking[1] filed by Robert Bosch LLC ("Bosch") requesting that the Federal Communications Commission ("FCC" or "Commission") review and amend the Part 15, Subpart F regulations governing Ultra-Wideband ("UWB") devices and systems. Alteros respectfully supports Bosch's *Petition* and provides further recommendations.

I. INTRODUCTION AND BACKGROUND

Alteros, an Audio-Technica company, was formed in 2016 and is dedicated to the research, development, and sales of innovative technologies with a special focus on the evolving radiofrequency ("RF") landscape and creating high-end wireless solutions for live audio production, broadcast studios, sports events, and theater applications in the ever shrinking frequency spectrum. Alteros' products capitalize on Audio-Technica's extensive research in UWB and RF technology and innovative digital solutions to solve the most demanding technical

[1] *In the Matter of Amendment of Rules Governing Ultra-Wideband Devices and Systems*, Petition for Rulemaking of Robert Bosch LLC, RM-11844 (filed June 18, 2019) ("*Petition*").

problems. As spectrum for high profile events has become increasingly constrained, Alteros has developed technological solutions that will allow wireless microphones and other broadcast auxiliary services, both licensed and unlicensed, to successfully operate outside of the television bands without disrupting existing licensed services. To this end, Audio-Technica invested millions of dollars in the research, development, production, and launch of the world's first UWB digital wireless microphone system and then followed this innovation with the formation of a new company, Alteros. In less than a year, Alteros had already won awards and was recognized for designing and providing technically-advanced digital wireless products used in the highest level venues and most critical performance applications proving its expert experience in the design, manufacture and use of UWB devices and systems and their successful co-existence with other licensed and unlicensed devices and systems.

In 2002, after significant time and money had been invested to study the potential effects of a new unlicensed wireless technology on existing government and non-government services, the Commission proceeded with extreme caution in authorizing the then-new UWB technology. [2] In the *First Report and Order,* the Commission noted that "UWB technology holds great promise for a vast array of new applications that we believe will provide significant benefits for public safety, business and consumers."[3] It also noted that "[w]ith appropriate technical standards, UWB devices can operate using spectrum occupied by existing radio services without causing interference, thereby permitting scarce spectrum resources to be used more efficiently."[4]

[2] *In the matter of Revision of Part 15 of the Commission's Rules Regarding Ultra-Wideband Transmission Systems*, First Report and Order, ET Docket 98-153 (rel. April 22, 2002) ("*First Report and Order*").
[3] *Id.*
[4] *Id.*

At the time, the Commission's determinations were correct. The numerous highly-qualified and carefully-conducted studies that preceded the *First Report and Order* determined that technically severe standards were required in order to protect incumbent services.[5] As such, the technical standards that were adopted were so cautious that the Commission noted its concern that the standards it adopted "may be overprotective and could unnecessarily constrain the development of UWB technology."[6] This concern also proved to be warranted.

Now, in 2019, we have first-hand proof of the result of that constraint. Rather than the rapid development of a vast array of devices and services using UWB, in order to deliver significant benefits, a painfully slow and technically difficult yet innovative path has only recently provided proof of this superior solution for addressing public safety, business, commercial, industrial, medical and consumer wireless needs. With the benefit of 16 years of experience, it is now clear that the artificial constraints to mass-adoption and the overprotective technical regulations are not needed. The originally envisioned "great promise for a vast array of new applications that we believe will provide significant benefits for public safety, business and consumers"[7] is now very possible.

II. DISCUSSION

Alteros believes that a win-win regulatory position is possible for the manufacturers of WiFi/WLAN equipment, UWB equipment, 5G devices, and those incumbents, who currently utilize licensed and unlicensed spectrum for their critical applications and functions, to be able to operate with spectrum, allowing for maximized co-existence, performance, and choice. In order to

[5] *First Report and Order at* ¶4, ¶¶70-171.
[6] *First Report and Order at* ¶1.
[7] *Id*.

do so, it is time to re-evaluate the UWB technical regulations and the legacy 1990's technical regulations for WiFi.

Bosch correctly points out that the Commission has failed to act upon the recommended action in the *First Report and Order,* which noted "within the next six to twelve months we intend to review the standards for UWB devices and issue a further *rulemaking* to explore more flexible technical standards and to address the operation of additional types of UWB operations and technology."[8] After sixteen years of technological investment and UWB device deployment across a wide array of highly beneficial uses, there remain no documented complaints of interference from UWB devices. In this regard, Alteros applauds the care and caution that went into the development of the *First Report and Order,* however, Alteros agrees with Bosch's position that it is now time for the re-evaluation that was planned for in 2002.

We find ourselves in a time where the demand for wireless service exceeds what could have been imagined in 2002. We have spent the last sixteen years watching the development of wireless that benefits human quality of life, safety, entertainment, education, medical treatment, communication and professional, commercial and industrial applications as possibilities for wireless use have grown exponentially. No one would want to stop this progress, but as it was essential in leading up to the 2002 *First Report and Order,* careful study, consideration, and caution are required as we move forward.

We find that the recommendations in Bosch's *Petition* represent an opportunity for modernizing not just UWB, but wireless delivery in general. The artificially suppressed application of UWB limited its true potential. WiFi, an older technology, has proliferated un-checked in a manner that results in very frequent interference complaints and customer dissatisfaction with

[8] *Id.*

performance. While everyone recognizes the value of improved wireless delivery for both consumer and commercial use, simply expanding spectrum for WiFi is not an improvement – it is just "more." In fact, simply expanding WiFi spectrum goes against all the work and consideration that went into the original 2002 *First Report and Order*, which endeavored to ensure protection for critical incumbent users. With only slight modifications to the UWB technical standards and regulations, operation of devices very close to WiFi, yet to be updated and improved, may be possible. By creating updated standards and by careful placement and protection that encourages multiple methods of wireless device and service categories, the Commission can ensure that investment in WiFi innovation will flourish, that investment in UWB will flourish, that protection of government and non-government incumbents will be maintained, and that the US will lead the world in wireless access and options.

In addition to the opportunity to create better economic and performance value for both wireless device manufacturers and users, by reviewing and amending the Part 15, Subpart F regulations governing UWB devices and systems, the Commission can also continue to support the needs of professional wireless microphone users who have suffered disproportionately due to the recent spectrum regulatory changes and severe over-crowding. Ironically, the demands for higher data rates and more spectrum for VR/AR and high-quality content streaming depend upon wireless audio devices in order to create this content. These wireless audio devices are now experiencing extreme disruption. In reviewing and amending the UWB regulations, the Commission can create rules to support content creation as well as greatly improved delivery methods from a quality, density of coverage, and economic value standpoint.

With the ever-increasing demand for wireless devices to fit in constrained spectrum and to operate at increasing bandwidth and quality requirements, Alteros acknowledges that the Commission has a difficult job to piece together the best options, regulations, and tradeoffs. As part of this effort, there is good reason for the Commission to review UWB operation as originally defined in the *First Report and Order* and to now amend the Part 15, Subpart F regulations governing UWB devices and systems. It is time to provide a better class of service that takes advantage of new technological innovation and encourages co-existence, in order to satisfy an evolutionary set of industrial, commercial, professional, and consumer requirements. By adjusting UWB regulations to be more in line with WiFi regulations (and vice versa), manufacturers will realize a better economy of scale and wireless end users will benefit from a wider range of higher performance wireless choices.

In an early 2007 conference paper, "Interference Handling in UWB versus 802.11n Networks"[9], researchers from Carnegie Mellon University and Qualcomm confirmed that UWB, even operating within the severely restrictive 2002 technical specifications, had superior interference handling capability as compared to WLAN devices. They additionally found that performance is much more stable in a home environment taking into account wall loss.[10] The gap in interference performance between WLAN and UWB becomes even greater as device density increases, with UWB performance clearly out-ranking the WLAN. The goal of spectrum regulation should not be preferential to one specific technology or commercial method over another, but rather to devise technical regulations that will allow the best possible performance for users of the spectrum across as all applications.

[9] Rajeswaran, A., Kim, G., Negi, R., Shankar N., S., "Interference Handling in UWB Versus 802.11n Networks", Communications 2007. ICC 2007. IEEE International Conference. (2007).
[10] *Id*. at 5

With the minimal changes that Bosch suggests, the significant advantages of UWB operation will be further realized without danger of interference to incumbent devices and services. In addition, the changes then possible at the PHY and MAC level would approach methods compatible with modern, high bandwidth WiFi/WLAN. In effect, manufacturers may now be able to accomplish an updated WiFi/WLAN plus UWB implementation that allows for significant technical performance advantages, economies of scale, better spectrum sharing, and management techniques, while also delivering better device density through efficient control mechanisms. Adding device location and sensing ability to WiFi/WLAN type devices would offer many advantages. Precision ranging would allow for greatly improved density of operation as well as allowing for many new and novel use case applications. WiFi/WLAN requests and regulatory proposals have been moving towards ever-increasing operating bandwidth, moving towards UWB-type implementations. It makes sense to blend the best of each method towards improved harmonious methods. Better range, better power consumption, better control, and better performance are all possible with updated technical regulations. By increasing WiFi/WLAN bandwidth, reducing output power, decreasing UWB bandwidth, and increasing output power, a technically superior middle ground is achieved where both may be able to operate with more flexibility.

As such, Alteros supports following Bosch's suggestions for rule amendment: Section 15.31 Measurement standards; Section 15.503 Definitions; Section 15.507 Marketing of UWB equipment; Section 15.509 Technical requirements for ground penetrating radars and material sensing systems; Section 15.510 Technical requirements for Material Sensing Systems by Law Enforcement, Fire and Emergency Rescue Organization or by Construction or Industrial Professionals; Section 15.511 Technical requirement for surveillance, material sensing and

industrial monitoring systems; and Section 15.521 Technical requirements applicable to all UWB devices.[11]

Alteros agrees with Bosch's position that emission limits should be set to account for the shielding effect of the object being evaluated. This is especially applicable to UWB wireless microphones, since their use is generally near the body.

Alteros agrees with Bosch's request regarding re-evaluating the application of UWB technology onboard vehicles, such as ships. Wireless microphones are frequently used for entertainment and communication on ships. Ships move from location to location making selection of equipment, operating in varying and scarce spectrum, highly difficult. Utilizing UWB wireless microphones eliminates this problem.

Alteros notes that there is a unique class of service which is in dire need of attention. The current regulations and spectrum in which professional wireless microphones may operate do not satisfy operational requirements. Spectrum databases are not working and the limited remaining spectrum is not sufficient for wireless microphone operation. Alteros provides much-needed relief to these problems with their UWB wireless microphone technology. The Alteros systems are deployed by Part 74 users and provide proven solid performance and spectrum relief in the most critical applications. Bosch's suggestions for amendments do not impact or address our system operation, however, the reality of more devices, via WiFi/WLAN or other methods operating in the broadcast spectrum of 6 GHz, is certain. Alteros proposes that the Part 74 use of UWB wireless microphones be used as an essential tool requiring regulatory protection, which can be easily addressed in a review and amendment to the Part 15, Subpart F regulations governing UWB

[11] *Petition* at 1-2.

devices and systems. We also note that, in the *First Report and Order*, rules were created that required Part 90 licensing for UWB operation of some specific types of wireless equipment, under certain conditions by certain personnel or organizations. We would like to elaborate on this precedent.

III. FURTHER RECOMMENDATIONS

Based upon the overwhelming need and substantially compelling evidence that UWB wireless microphone devices improve wireless audio utilization without increasing the potential for interference to authorized radio services, in conjunction with the re-evaluation and amendment requests as presented by Bosch, Alteros requests the following:

- Create a Part 74 technical certification (or a permanent waiver) for UWB wireless microphones to allow for the same protection from unlicensed services, as afforded to Part 74 operators of Part 74 equipment, such that operation and protections are consistent in all areas of the spectrum for professional wireless microphone users.

- Adjust emissions limits to take into account body absorption for UWB wireless microphones.

- Allow use of UWB wireless microphones by Part 74 license holders on ships or other moving vehicles wherein performance, communication, and entertainment take place.

- Undertake a comprehensive study for the purpose of quantifying and understanding shared UWB and WiFi/WLAN technical parameters for the purpose of efficient co-existence and spectrum usage in a manner that does not disrupt any existing licensed or unlicensed users use of spectrum and accomplishes important performance/application goals.

- Limit expansion of WiFi/WLAN, utilizing traditional regulations, to operation below 6.150 GHz, thus encouraging the development of new, innovative, robust, and efficient co-existence methods for all devices in new spectrum going forward.

IV. CONCLUSION

Based on the foregoing, Alteros respectfully requests that the Commission consider the much needed review and amendment of the Part 15, Subpart F regulations governing UWB devices and systems, while taking into account the recommendations from both Bosch and Alteros. Alteros looks forward to working with Commissioners and staff in creating better opportunities for wireless utilization and expansion, which benefit all methods and applications.

Respectfully submitted,

ALTEROS, INC.

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